

General

Title

Acute myocardial infarction (AMI): hospital 30-day, all-cause, unplanned risk-standardized readmission rate (RSRR) following AMI hospitalization.

Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized readmission measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 112 p.

Measure Domain

Primary Measure Domain

Related Health Care Delivery Measures: Use of Services

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure estimates a hospital-level 30-day risk-standardized readmission rate (RSRR) for patients discharged from the hospital with a principal diagnosis of acute myocardial infarction (AMI). The outcome is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission. A specified set of planned readmissions do not count as readmissions.

The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for individuals who are 65 years and older and are Medicare Fee-for-Service (FFS) beneficiaries hospitalized in non-federal short-term acute care hospitals (including Indian Health Services hospitals) and critical access hospitals.

Rationale

Hospital readmission rates reflect quality and efficiency of care. Readmission of patients who were

recently discharged after hospitalization with acute myocardial infarction (AMI) represents an important, expensive, and often preventable adverse outcome. The risk of readmission can be modified by the quality and type of care provided to these patients. Improving readmission rates is the joint responsibility of hospitals and clinicians. Measuring readmission will create incentives to invest in interventions to improve hospital care, better assess the readiness of patients for discharge, and facilitate transitions to outpatient status.

Evidence for Rationale

Yale University/Yale-New Haven Hospital-Center for Outcomes Research & Evaluation (Yale-CORE). Hospital 30-day acute myocardial infarction readmission measure: methodology. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2008 Jun 9. 52 p. [24 references]

Primary Health Components

Acute myocardial infarction (AMI); 30-day readmission rate

Denominator Description

The measure cohort consists of admissions for Medicare Fee-for-Service (FFS) beneficiaries aged 65 years and older and discharged from non-federal acute care hospitals and critical access hospitals, having a principal discharge diagnosis of acute myocardial infarction (AMI).

The risk-standardized readmission rate (RSRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital, multiplied by the national observed readmission rate. For each hospital, the denominator is the number of readmissions expected based on the nation's performance with that hospital's case-mix.

See the related "Denominator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the measure cohort.

See the [2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures](#) for more details.

Numerator Description

The measure assesses unplanned readmissions to an acute care hospital, from any cause, within 30 days from the date of discharge from an index acute myocardial infarction (AMI) admission.

The risk-standardized readmission rate (RSRR) is calculated as the ratio of the number of "predicted" readmissions to the number of "expected" readmissions at a given hospital, multiplied by the national observed readmission rate. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted based on the hospital's performance with its observed case-mix.

See the related "Numerator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the [2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures](#) for more details.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Many care processes can influence readmission risk. In general, randomized controlled trials have shown that improvement in the following areas can directly reduce readmission rates: quality of care during the initial admission; improvement in communication with patients, their caregivers and their clinicians; patient education; predischARGE assessment; and coordination of care after discharge. Evidence that hospitals have been able to reduce readmission rates through these quality-of-care initiatives illustrates the degree to which hospital practices can affect readmission rates. Successful randomized trials have reduced 30-day readmission rates by 20% to 40% (Jack et al., 2009; Coleman et al., 2004; Courtney et al., 2009; Garasen, Windspoll, & Johnsen, 2007; Koehler et al., 2009; Mistiaen, Francke, & Poot, 2007; Naylor et al., 1994; Naylor et al., 1999; van Walraven et al., 2002; Weiss, Yakusheva, & Bobay, 2010; Krumholz et al., 2002). The Project RED (Re-Engineered Discharge) intervention, in which a nurse was assigned to each patient as a discharge advocate, responsible for patient education, follow-up, medication reconciliation, and preparing individualized discharge instructions sent to the patient's primary care provider and there was a follow-up phone call from a pharmacist within 4 days of discharge demonstrated a 30% reduction in 30-day readmissions (Jack et al., 2009).

Specific interventions among patients with acute myocardial infarction (AMI) that have been shown to significantly reduce the rate of readmission include disease management programs that involved home visits by cardiac-trained nurses, standardized checklists, communication with physicians, and patient education (Young et al., 2003). Similarly, in observational studies, enrollment in cardiac rehabilitation programs has been found to be associated with significant reductions in readmission after AMI (Mudrick et al., 2013).

Evidence for Additional Information Supporting Need for the Measure

Coleman EA, Smith JD, Frank JC, Min SJ, Parry C, Kramer AM. Preparing patients and caregivers to participate in care delivered across settings: the Care Transitions Intervention. *J Am Geriatr Soc.* 2004 Nov;52(11):1817-25. [PubMed](#)

Courtney M, Edwards H, Chang A, Parker A, Finlayson K, Hamilton K. Fewer emergency readmissions and better quality of life for older adults at risk of hospital readmission: a randomized controlled trial to determine the effectiveness of a 24-week exercise and telephone follow-up program. *J Am Geriatr Soc.* 2009 Mar;57(3):395-402. [PubMed](#)

Garasen H, Windspoll R, Johnsen R. Intermediate care at a community hospital as an alternative to prolonged general hospital care for elderly patients: a randomised controlled trial. *BMC Public Health.* 2007 May 2;7:68. [PubMed](#)

Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM, Johnson AE, Forsythe SR, O'Donnell JK, Paasche-Orlow MK, Manasseh C, Martin S, Culpepper L. A reengineered hospital discharge program to decrease rehospitalization: a randomized trial. *Ann Intern Med.* 2009 Feb 3;150(3):178-87. [PubMed](#)

Koehler BE, Richter KM, Youngblood L, Cohen BA, Prengler ID, Cheng D, Masica AL. Reduction of 30-day postdischarge hospital readmission or emergency department (ED) visit rates in high-risk elderly medical patients through delivery of a targeted care bundle. *J Hosp Med.* 2009 Apr;4(4):211-8. [PubMed](#)

Krumholz HM, Amatruda J, Smith GL, Mattera JA, Roumanis SA, Radford MJ, Crombie P, Vaccarino V. Randomized trial of an education and support intervention to prevent readmission of patients with heart failure. *J Am Coll Cardiol*. 2002 Jan 2;39(1):83-9. [PubMed](#)

Mistiaen P, Francke AL, Poot E. Interventions aimed at reducing problems in adult patients discharged from hospital to home: a systematic meta-review. *BMC Health Serv Res*. 2007;7:47. [111 references] [PubMed](#)

Mudrick DW, Shaffer L, Lalonde M, Ruhil A, Lam G, Hickerson J, Caulin-Glaser T, Snow R. Cardiac rehabilitation participation reduces 90-day hospital readmissions after acute myocardial infarction or percutaneous coronary intervention. *J Am Coll Cardiol*. 2013 Mar 10;61(10):E1418.

Naylor M, Brooten D, Jones R, Lavizzo-Mourey R, Mezey M, Pauly M. Comprehensive discharge planning for the hospitalized elderly. A randomized clinical trial. *Ann Intern Med*. 1994 Jun 15;120(12):999-1006. [PubMed](#)

Naylor MD, Brooten D, Campbell R, Jacobsen BS, Mezey MD, Pauly MV, Schwartz JS. Comprehensive discharge planning and home follow-up of hospitalized elders: a randomized clinical trial. *JAMA*. 1999 Feb 17;281(7):613-20. [PubMed](#)

van Walraven C, Seth R, Austin PC, Laupacis A. Effect of discharge summary availability during post-discharge visits on hospital readmission. *J Gen Intern Med*. 2002 Mar;17(3):186-92. [PubMed](#)

Weiss M, Yakusheva O, Bobay K. Nurse and patient perceptions of discharge readiness in relation to postdischarge utilization. *Med Care*. 2010 May;48(5):482-6. [PubMed](#)

Young W, Rewa G, Goodman SG, Jaglal SB, Cash L, Lefkowitz C, Coyte PC. Evaluation of a community-based inner-city disease management program for postmyocardial infarction patients: a randomized controlled trial. *CMAJ*. 2003 Oct 28;169(9):905-10. [PubMed](#)

Extent of Measure Testing

Assessment of Updated Models

The acute myocardial infarction (AMI) readmission measure estimates hospital-specific 30-day all-cause risk-standardized readmission rates (RSRRs) using a hierarchical logistic regression model. Refer to Section 2 in the original measure documentation for a summary of the measure methodology and model risk-adjustment variables. Refer to prior methodology and technical reports for further details.

The Centers for Medicare & Medicaid Services (CMS) evaluated and validated the performance of the models using July 2013 to June 2016 data for the 2017 reporting period. They also evaluated the stability of the risk-adjustment model over the three-year measurement period by examining the model variable frequencies, model coefficients, and the performance of the risk-adjustment model in each year.

CMS assessed logistic regression model performance in terms of discriminant ability for each year of data and for the three-year combined period. They computed two summary statistics to assess model performance: the predictive ability and the area under the receiver operating characteristic (ROC) curve (c-statistic). CMS also computed between-hospital variance for each year of data and for the three-year combined period. If there were no systematic differences between hospitals, the between-hospital variance would be zero.

The results of these analyses are presented in Section 4.2 of the original measure documentation.

AMI Readmission 2017 Model Results

Frequency of AMI Model Variables

CMS examined the change in the frequencies of clinical and demographic variables. Frequencies of model variables were stable over the measurement period. The largest changes in the frequencies (those greater than 2% absolute change) include:

- An increase in History of coronary artery bypass graft (CABG) surgery (11.9% to 14.1%)
- A decrease in Coronary atherosclerosis/other chronic ischemic heart disease (87.1% to 84.8%)

AMI Model Parameters and Performance

Table 4.2.2 in the original measure documentation shows hierarchical logistic regression model variable coefficients by individual year and for the combined three-year dataset. Table 4.2.3 in the original measure documentation shows the risk-adjusted odds ratios (ORs) and 95% confidence intervals for the AMI readmission model by individual year and for the combined three-year dataset. Overall, the variable effect sizes were relatively constant across years. In addition, model performance was stable over the three-year time period; the c-statistic increased slightly from 0.65 to 0.66.

Refer to the original measure documentation for additional information.

Evidence for Extent of Measure Testing

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized readmission measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 112 p.

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 65 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Priority

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Not within an IOM Care Need

IOM Domain

Not within an IOM Domain

Data Collection for the Measure

Case Finding Period

Discharges July 1, 2013 through June 30, 2016

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions

An *index admission* is the hospitalization to which the readmission outcome is attributed and includes admissions for patients:

- Having a principal discharge diagnosis of acute myocardial infarction (AMI)*
- Enrolled in Medicare Fee-for-Service (FFS) Part A and Part B for the 12 months prior to the date of admission, and enrolled in Part A during the index admission
- Aged 65 or over
- Discharged alive from a non-federal short-term acute care hospital
- Not transferred to another acute care facility

*International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes used to define the AMI cohort for discharges on or after October 1, 2015:

- I21.01 ST elevation myocardial infarction (STEMI) involving left main coronary artery
- I21.02 STEMI involving left anterior descending coronary artery
- I21.09 STEMI involving other coronary artery of anterior wall
- I21.11 STEMI involving right coronary artery
- I21.19 STEMI involving other coronary artery of inferior wall
- I21.21 STEMI involving left circumflex coronary artery
- I21.29 STEMI involving other sites
- I21.3 STEMI of unspecified site
- I21.4 Non-ST elevation myocardial infarction (NSTEMI)

Note: International Classification of Diseases, Ninth Revision (ICD-9) code lists for discharges prior to October 1, 2015 can be found in the [2016 Condition-specific Measures Updates and Specifications Report: Hospital-Level 30-Day Risk-Standardized Readmission Measures](#)

Exclusions

- Without at least 30 days of post-discharge enrollment in Medicare FFS
- Discharged against medical advice
- Same-day discharges
- AMI admissions within 30 days of discharge from a prior AMI index admission

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

The measure assesses unplanned readmissions, from any cause, within 30 days from the date of a discharge from an index acute myocardial infarction (AMI) admission. Only an unplanned inpatient admission to a short-term acute care hospital can qualify as a readmission.

If a patient has more than one unplanned admission within 30 days of discharge from the index admission, only the first is considered a readmission. The measures assess a dichotomous yes or no outcome of whether each admitted patient has any unplanned readmission within 30 days. If the first readmission after discharge is planned, any subsequent unplanned readmission is not considered in the outcome for that index admission because the unplanned readmission could be related to care provided during the intervening planned readmission rather than during the index admission.

The risk-standardized readmission rate (RSRR) is calculated as the ratio of the number of "predicted"

readmissions to the number of "expected" readmissions at a given hospital, multiplied by the national observed readmission rate. For each hospital, the numerator of the ratio is the number of readmissions within 30 days predicted based on the hospital's performance with its observed case-mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the [2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures](#) for more details.

Exclusions

Admissions identified as planned by the planned readmissions algorithm are not counted as readmissions. The planned readmission algorithm is a set of criteria for classifying readmissions and planned among the general Medicare population using Medicare administrative claims data. The algorithm identifies admissions that are typically planned and may occur within 30 days of discharge from the hospital.

The planned readmission algorithm has three fundamental principles:

- A few specific, limited types of care are always considered planned (transplant surgery, maintenance chemotherapy/immunotherapy, rehabilitation);
- Otherwise, a planned readmission is defined as a non-acute readmission for a scheduled procedure; and
- Admissions for acute illness or for complications of care are never planned

The planned readmission algorithm uses a flow chart and four tables of specific procedure categories and discharge diagnosis categories to classify readmissions as planned. The flow chart and tables are available in the [2017 Condition-specific Measures Updates and Specifications Report: Hospital-level 30-day Risk-standardized Readmission Measures](#) .

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Proxy for Outcome

Instruments Used and/or Associated with the Measure

Planned Readmission Algorithm Version 4.0 (ICD-10) Flowchart

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

Risk-Adjustment Variables

In order to account for differences in case mix among hospitals, the measure adjusts for variables (for example, age, comorbid diseases, and indicators of patient frailty) that are clinically relevant and have relationships with the outcome. For each patient, risk-adjustment variables are obtained from inpatient, outpatient, and physician Medicare administrative claims data extending 12 months prior to, and including, the index admission.

The measure adjusts for case mix differences among hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the course of the hospitalization, are included in the risk adjustment.

The measure does not adjust for socioeconomic status (SES) because the association between SES and health outcomes can be due, in part, to differences in the quality of health care that groups of patients with varying SES receive. The intent is for the measures to adjust for patient demographic and clinical characteristics while illuminating important quality differences. As part of the National Quality Forum (NQF) endorsement process for this measure, the Centers for Medicare & Medicaid Services (CMS) completed analyses for the two-year Sociodemographic Trial Period. Although univariate analyses found that the patient-level observed (unadjusted) readmission rates are higher for dual-eligible patients (for patients living in lower Agency for Healthcare Research and Quality [AHRQ] SES Index census block groups) and African-American patients compared with all other patients, analyses in the context of a multivariable model demonstrated that the effect size of these variables was small, and that the c-statistics for the models are similar with and without the addition of these variables.

Refer to Appendix D of the original measure documentation for the list of comorbidity risk-adjustment variables and the list of complications that are excluded from risk adjustment if they occur only during the index admission.

Standard of Comparison

not defined yet

Identifying Information

Original Title

Hospital-level 30-day RSRR following AMI.

Measure Collection Name

National Hospital Inpatient Quality Measures

Measure Set Name

Readmission Measures

Submitter

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Developer

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Yale-New Haven Health Services Corporation/Center for Outcomes Research and Evaluation under contract to Centers for Medicare & Medicaid Services - Academic Affiliated Research Institute

Funding Source(s)

Centers for Medicare & Medicaid Services (CMS)

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This measure was developed by a team of experts:

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Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2016 Dec 9

Core Quality Measures

Cardiology

Measure Initiative(s)

Hospital Compare

Hospital Inpatient Quality Reporting Program

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2017 Mar

Measure Maintenance

Annual

Date of Next Anticipated Revision

2018 Apr

Measure Status

This is the current release of the measure.

This measure updates a previous version: Specifications manual for national hospital inpatient quality measures, version 5.0b. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; Effective 2015 Oct 1. various p.

Measure Availability

Source available from the [QualityNet Web site](#) .

Check the QualityNet Web site regularly for the most recent version of the specifications manual and for the applicable dates of discharge.

Companion Documents

The following are available:

Hospital compare: a quality tool provided by Medicare. [internet]. Washington (DC): U.S. Department of Health and Human Services; [accessed 2017 Oct 30]. Available from the [Medicare Web site](#) .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 Medicare hospital quality chartbook. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the [Centers for Medicare & Medicaid Services \(CMS\) Web site](#) .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific readmission measures updates and specifications report: supplemental ICD-10 code lists for use with claims for discharges on or after October 1, 2015. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the [QualityNet Web site](#) .

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